

MARINE TURTLES IN NORTHERN AUSTRALIA

by H. G. Cogger
(Australian, Museum, Sydney)

and

D. A. Lindner
(Primary Industries Branch, Northern Territory Administration, Darwin)
(Plates VI-VII; text-fig. 1.)

INTRODUCTION

The work reported here began as part of a systematic survey of the reptiles and amphibians of the Coburg Peninsula Wildlife Sanctuary being carried out by the authors for C.S.I.R.O. Division of Wildlife Research. Preliminary data indicated not only the presence of previously unrecorded species of marine turtles but also that the species breeding in the area possessed diagnostic differences in habits and breeding biology. Subsequently one of us (D.A.L.) made casual observations and collections extending over a period of 2 years, while stationed at Port Essington as Ranger of Coburg Peninsula Wildlife Sanctuary (Fig. 1). During this time aboriginal informants confirmed many of these observations and assisted in the collection of specimens. Some additional data and specimens were collected by the other author on the Sir Edward Pellew Islands in the Gulf of Carpentaria, where survey work was also undertaken under the auspices of C.S.I.R.O. Division of Wildlife Research.

Studies of Australian marine turtles are few. Moorhouse's (1933) study of the green turtle (*Chelonia mydas*) at Heron Island, on the southern end of the Great Barrier Reef, has provided the only significant information on the biology of a marine turtle in Australian waters. Bustard (1966) has published brief notes on his current long-term studies of *Chelonia mydas* and the loggerhead (*Caretta caretta*) at Heron Island.

The value of Fry's work (1913) on the flatback turtle (*Chelonia depressa*) is only now being recognised. The status of this species has recently been re-examined by Williams *et. al.* (1967) who have supported Fry's conclusions. Studies of the marine turtles of Ceylon by Deraniyagala (1953; for numerous earlier publications on marine turtles see references in 1953 paper) have helped to clarify the taxonomic status of Indo-Pacific turtles, while the work of Carr and his colleagues on New World turtles has resulted in a wealth of information on the ecology, biology and conservation of several species. Harrison (1961, 1962; see former paper for references to his numerous prior publications on turtles) has made valuable observations on a number of species of marine turtles occurring in the waters off Sarawak.

In the present paper five species of marine turtles are recorded from Northern Territory waters, including the first record of a breeding population of the olive-backed turtle (*Lepidochelys olivacea*) in Australian waters.

Only three of these five species are known to breed in the area. They are *Chelonia mydas*, *Chelonia depressa* and *Lepidochelys olivacea*. *Caretta caretta* and the hawksbill (*Eretmochelys imbricata*), though plentiful in the coastal waters of the Northern Territory, have yet to have nesting records in the area confirmed.

The leathery turtle (*Dermochelys coriacea*), though not seen during the course of our observations, has been included in the key for the sake of completeness. It is widely distributed throughout Australian waters, but there are no nesting records for Australia.

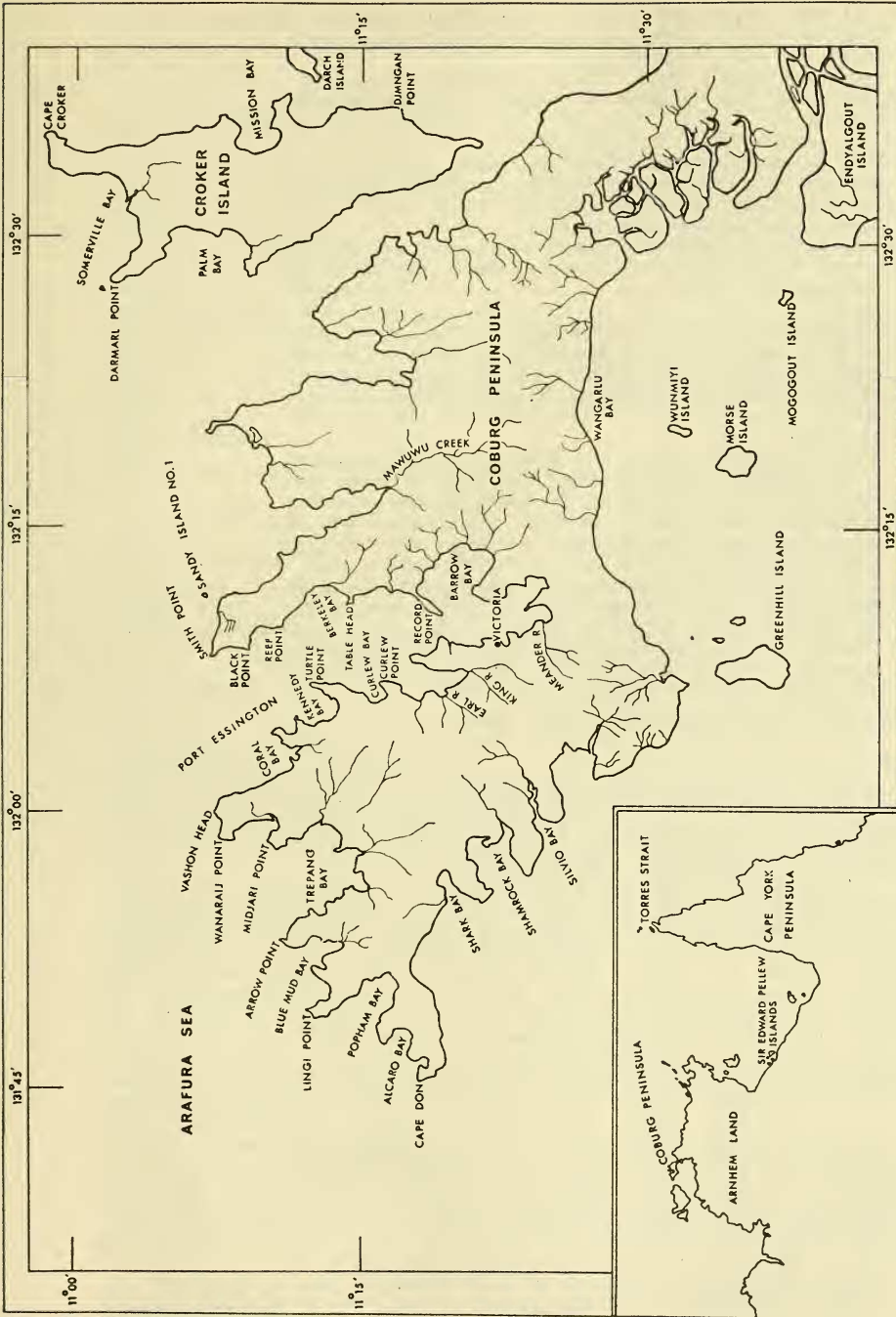


Fig. 1. Map of Coburg Peninsula, Northern Territory, showing localities mentioned in text. Inset shows location of Coburg Peninsula and Sir Edward Pellew Islands.

KEY TO THE GENERA AND SPECIES OF AUSTRALIAN MARINE TURTLES

1. Carapace with a series of enlarged shields; one or two claws on each forelimb 2
 Carapace without regular shields, covered by a leathery skin with five longitudinal ridges; forelimbs without claws *Dermochelys coriacea*
2. Four costal shields on each side 3
 Five or more costal shields on each side 5
3. One pair of prefrontals; shields of carapace never imbricate; tip of upper jaw not extending outwards and downwards to form a narrow projecting beak 4
 Two pairs of prefrontals; shields of carapace (at least in adults) frequently imbricate; tip of upper jaw extending outwards and downwards to form a narrow projecting beak *Eretmochelys imbricata*
4. Usually four or more postoculars; a series of enlarged scales on the upper eyelid, the larger of which are at least half the width of the adjoining prefrontal; distal half of forelimb almost entirely covered by enlarged scales, without distinct areas of smaller irregular scales between the phalanges *Chelonia mydas*
 Three postoculars; upper eyelid composed of numerous small, irregular, subequal scales, the larger of which are much less than one quarter the width of the adjoining prefrontal; distal half of forelimb with single rows of enlarged scales extending along phalanges separated by areas of smaller irregular scales or wrinkled skin *Chelonia depressa*
5. Four enlarged inframarginals on the bridge, with or without pores; usually six or more costals on either side; adults olive-grey, dorsally, hatchlings almost black *Lepidochelys olivacea*
 Usually three enlarged inframarginals on the bridge, without pores; rarely more than five costals on either side; adults and young distinctly reddish-brown dorsally *Caretta caretta*

HAWKSBILL TURTLE, *Eretmochelys imbricata* (Linne)

This species occurs commonly in the waters of northern Australia. Most sightings at Coburg Peninsula were of sub-adult specimens (averaging between 12 and 20 inches in carapace length) which were frequently sighted around coral and rocky reefs. Only four records of adult specimens were made; one of these was a sighting of a large specimen, approaching three feet in length, off Vashon Head. The remaining three records are based on an examination of turtle shell held by natives at Cape Don.

Aboriginal informants at Cape Don were confident that this species occasionally nested in the area, but as no hatchlings or small juveniles were seen in the course of our observations the nesting of *Eretmochelys imbricata* on Coburg Peninsula remains an open question. Similarly, in the Sir Edward Pellew Islands, no nesting was recorded, but local informants left little doubt that the species does nest in the area. It seems certain, however, that nesting at Coburg Peninsula is too sparse to be considered responsible for the relative abundance of sub-adult Hawksbills in that area.

A survey of the literature does little to clarify the situation. The only nesting record that we can find for Australian waters is that of Musgrave and Whitley (1926), who reported that "... According to Surgeon-Lieut. W. E. J. Paradice, R.A.N. the Hawksbill lays ... on Thursday Island, and perhaps breeds southward as far as Low Island, Queensland." However, 2 hatchlings (A4905 and A4906) in the Australian Museum collection were collected 90 years ago in Torres Strait by Alex Morton. Although it was recorded that these emerged at 10 p.m. on 20th September, 1878, the immediate location of the nest is not recorded. Thus while it seems probable that some nesting occurs over a wide area of northern Australia, further surveys will be needed to determine the extent of breeding populations.

The richly-coloured carapaces of many hawksbills may be encrusted with barnacles and covered by a fine growth of algae. Such specimens have a

characteristic pallid appearance under water which is distinct from the typical, brightly-patterned and clean-shelled sub-adult *Chelonia mydas* seen often in the same areas.

The overlapping carapace shields often characteristic of larger *E. imbricata* are not developed in hatchlings and the latter, in size and reddish-coloration, may superficially resemble hatchling *Caretta caretta*.

Partly because of a decline in pearling operations in northern Australian waters and the concentration of the aboriginal population at government settlements and church missions, hawksbills have long been relatively free from interference by humans over much of their range. Recently, however, there has been a revival in the demand for tortoise shell (Carr, 1964), and shell is constantly being sought by Japanese currently working with the Port Essington pearl culture farm.

The operation of Australian-Japanese prawn trawlers out of Australian ports could result in a dramatic increase in the demand for this species. This factor, together with an expanding tourist market for whole mounted specimens, might well encourage aboriginals again to take up large scale hunting and trading of hawksbill turtles. If this occurs, conservation measures will probably be necessary.

OLIVE-BACKED TURTLE OR PACIFIC RIDLEY, *Lepidochelys olivacea* (Eschscholtz)

Lepidochelys olivacea is widely distributed throughout the Indo-Pacific region (Deraniyagala, 1953; Loveridge, 1945; Carr, 1952). However the only record from Australian waters is that of Brongersma (1961) who listed a specimen in the British Museum (Natural History) from Torres Strait.

It would appear, however, that this species occurs commonly in northern Australia and that it nests in many areas. We have recorded nests at various localities between Gove Peninsula and Coburg Peninsula, while reliable reports have been received of nesting on Bathurst and Melville Islands.

Largely because of their colour, adult *L. olivacea* in north Australia are frequently confused with *Chelonia depressa* by Europeans. This contrasts with the literature, in which *L. olivacea* has usually been confused with the more closely allied *Caretta caretta*.

Because *L. olivacea* nests extensively along the Arnhem Land coast its eggs and hatchlings, which are considerably smaller than those of *C. depressa*, have been seen by many of the Europeans living or operating small craft in that area. The operators of two small craft which visited Black Point were shown live hatchlings of this species and were rather surprised at their identity, having always regarded them as the young of *Eretmochelys imbricata*.

Many authors (Boulenger, 1889; Smith, 1931; McCann, 1966) have regarded *L. olivacea* as merely a subspecies or a synonym of *Caretta caretta*. However Deraniyagala (1933, 1953) pointed out numerous distinguishing features and showed clearly that the two species are distinct.

L. olivacea is the smallest of the Indo-Pacific cheloniid turtles, and females are known to mature at a carapace length of about 25 inches. The largest specimen recorded in the literature measures only 31.5 inches (Pritchard, 1967). In adults the snout is blunter and less beak-like than in *Caretta*. The smooth carapace is relatively deep, domed anteriorly and subcircular in outline. Our specimens agree in all respects with those described from elsewhere in the Pacific (Deraniyagala, 1953).

Unlike other cheloniid turtles *Lepidochelys* is extremely variable in the numbers of its costal shields. However only rarely do the costals number fewer than six; only one of the 42 specimens examined by us has five costals, and this count is restricted to one side only. Deraniyagala (1934) records only one instance of 5 pairs of costals in 378 specimens of *Lepidochelys* examined.

All but two of our 42 specimens have 26 marginal shields; the remaining two each have one of these divided to give a count of 27. All have 4 enlarged inframarginals on each side of the plastron, each with a pore near its

posterior margin. Adult specimens are dull olive grey above; white to pale yellow below. Other scale counts vary as follows in our series (figures in parentheses represent the number of specimens):

Postoculars: 3 + 3 (12); 3 + 4 (15); 4 + 4 (14).

Postparietals: 2 (11); 3 (3); 4 (7); 5 (13); 6 (5); 7 (1); 8 (1).

Vertebrales: 5 (3); 6 (11); 7 (27).

Hatchling *L. olivacea* range from 42 mm. to 46 mm. in carapace length; the carapace has three longitudinal ridges while the colour is black above, mottled dark brown and whitish below.

At Coburg Peninsula 9 sightings of adult specimens of *L. olivacea* were made, 7 of which were of specimens basking on the surface in depths exceeding 5 fathoms.

Although only one nesting was actually observed, the tracks, nesting sites and eggs of the species are diagnostic. More than 50 nests were noted, of which 12 were randomly selected to confirm the accuracy of the nest identifications. All of these proved to belong to *Lepidochelys* (as confirmed by identifications of embryos and hatchlings). Clutch sizes in six nests varied from 50 to 147 (mean 108), the slightly elliptical eggs measuring from 38.5 to 41.0 mm. in diameter (mean 38.8). Incubation times (from day of laying to day of hatching) for four nests ranged from 48 to 52 days (mean 50 days). All nests were recorded between January 31st and March 17th, 1967, and during March, 1968. Deraniyagala (1953) records clutches varying from 90-135.

At present many of the small islands on which *Lepidochelys olivacea* nests are rarely visited by man and are not inhabited by any of the predators (e.g. dingoes, monitor lizards) which frequently destroy mainland turtle nests. Basking adults are extremely unwary of approaching boats but the flesh is not esteemed by aboriginals and adults are rarely hunted. The main threat to the survival of the species would seem to lie in the population growth and development of the northern coast. However, any conservation program designed to protect important nesting beaches of *Chelonia depressa* would probably also ensure the survival of this more widely distributed species in Australian waters.

LOGGERHEAD TURTLE, *Caretta caretta* (Linne)

Although well known by local natives, this species would appear to be the least common turtle in the area. Six specimens were observed, while two other turtle sightings were regarded as possibly being *Caretta*. Natives informed us that the species was not infrequently encountered during hunts for *Chelonia mydas* in Bluemud Bay between Kuper Point and Sandy Island Number One and north of Midjari Point in Trepang Bay. Because of the large adult size, the fact that the flesh is relatively tough, and probably mainly because small *C. mydas* are generally easily found in these same areas, *Caretta* is rarely killed for food. No record of this species nesting in the area was made and local natives could recall no instances of its breeding on the Peninsula. The single specimen collected was taken in the prawn net of the "Pathfinder K" off Reef Point, in seven fathoms.

With the removal of *Lepidochelys olivacea* from the synonymy of *C. caretta*, the latter species is less variable in external morphology than many descriptions have implied. Deraniyagala (1953), Carr (1952) and Pritchard (1967) have found little variation in costal counts in *C. caretta*, compared with considerable variation in these characters in *L. olivacea*, while each species has a characteristic inframarginal condition (see key). The number and disposition of the shields in the carapace are subject to greater variation in *L. olivacea* than in *C. caretta*.

FLATBACK OR GREYBACK TURTLE, *Chelonia depressa* Garman

The status of *C. depressa* has frequently been disputed. Barbour (1914) has pointed out that one of Garman's cotypes (No. 2. M.C.Z. 1413, from Penang,

Malaya) is conspecific with *Chelonia mydas*. The other juvenile cotype (M.C.Z. 4473, from North Australia) Loveridge (1934) considered to be an aberrant *mydas*, as did Boulenger (1889), Siebenrock (1909), M. Smith (1931) and Mertens and Wermuth (1955).

Although Baur (1890) disputed Boulenger's action and McCulloch (1908) in describing *Natator tessellatus*, also recognised the validity of *depressa*, the first significant paper dissenting from this view was that of Fry (1913), who showed clearly that *depressa* and *mydas* were distinct species which could be readily distinguished on numerous morphological features. Fry's work was all the more remarkable considering that he was not acquainted with *depressa* in the field, nor had he seen adult material. Subsequently Williams *et. al.* (1967) have confirmed the reliability of most of the features on which Fry differentiated *depressa* from *mydas*, and have provided additional distinguishing characters. Nevertheless these authors have still only "tentatively" regarded *C. depressa* as a distinct species. It is only fair to point out that failure to recognise *depressa* as a distinct species has been almost entirely confined to workers outside Australia. Specimens received by at least two Australian museums during the past 55 years were correctly identified and catalogued under *depressa* when they were acquired. Glauert (1928) listed *C. depressa* and included it in a key to Western Australian turtles. Worrell (1963) erroneously referred *C. depressa* to *Chelonia japonica*; however he was fully acquainted with the species in the field and noted several generalised features distinguishing *depressa* from *mydas*. Although he mentioned "prominent osteological differences" between the two, he did not describe such differences.

We have little really significant information to add to Fry's (1913) description of *C. depressa* nor to the brief ecological notes given by Hugh W. Christie (and quoted by Fry).

The following variation in scale counts was noted in our series; counts for our small series of *C. mydas* are included for comparison. Similar asymmetrical counts have been lumped together, independent of the side on which the higher count occurs; numbers in parentheses indicate numbers of specimens.

	<i>depressa</i>	<i>mydas</i>
Costals	4 + 4 (59); 4 + 5 (4)	4 + 4 (37)
Marginals	24 (61); 25 (2)	24 (37)
Post-parietals	0 (2); 1 (36); 2 (13); 3 (11)	2 (21); 3 (6)
Postoculars	3 + 3 (63)	3 + 3 (1); 3 + 4 (2); 4 + 4 (21); 4 + 5 (12); 5 + 5 (2)

Those characters which we consider to be the most reliable diagnostic features are given in the key. Also, Fry (1913), quoting H. Christie, pointed out that the carapace of adult *C. depressa* is covered by a thin "greasy" skin which is usually free of barnacles, etc., whereas the carapace of adult *C. mydas* is covered by hard, horny plates. This distinction is extremely important and reliable, and readily distinguishes the two turtles in the field.

Williams *et. al.* (1967) list 15 characters in which significant, but not diagnostically reliable differences occur between *depressa* and *mydas*. They point out the difficulties in expressing some of these differences in unequivocal or empirical form, but some of these characters, such as the condition of the scales on the fore and hindlimbs (as figured by Fry, 1913), and the upper eyelid scales, appear to be totally diagnostic. On the other hand, we

have found some of their other features to be unreliable. In the condition of the prefrontal length relative to supraocular, 44% of 66 specimens of *depressa* examined have the *mydas* condition of prefrontal longer than supraocular; 19% have the *mydas* condition of prefrontal contacting the maxillary sheath; 39% have the *mydas* condition of first vertebral and first marginal in contact, while 19% have the *mydas* condition of paired postparietals, although asymmetry of the division is usually maintained. The description of the "subtemporals" for *mydas* and *depressa* were accidentally transposed in their list of characteristics on p. 3. The subtemporals are smaller and more numerous in *C. mydas* than in *C. depressa*.

Chelonia depressa is widely distributed along the coast from north-western Australia to eastern Queensland. Williams *et. al.* (1967) record specimens from various localities along the eastern coast of Queensland, while Bustard (1968) has recorded a breeding colony near Bundaberg, Queensland.

Although frequently considered a "rare" turtle (Bustard, 1968) *Chelonia depressa* is abundant. Its rarity in collections is almost undoubtedly due to the paucity of biological collecting in the areas in which it occurs most commonly.

In the shallow bay and coastal waters in which most of the observations were made (that is, in depths rarely exceeding 10 fathoms) *C. depressa*, in contrast with *C. mydas*, was not usually found in depths of less than three fathoms. However except in these shallow areas *C. depressa* was the most commonly observed turtle, the most frequent sightings being made in Port Essington and Port Bremer. Two specimens were collected by prawn trawlers between Black Point and Turtle Point, being netted in 7-8 fathoms. Although most sightings were of adult specimens, all growth stages were encountered down to two specimens of estimated carapace length less than 8 inches. Because of the light carapace coloration, basking specimens are often conspicuous at a considerable distance. The species appears to be unwary when on the surface and is generally easily approached within close harpooning distance. Older local natives who until 1939 had often been employed skin diving for trepang consider that *C. depressa* lives largely on trepang, having been frequently encountered where these were abundant. This view is supported by the fact that prawn trawlers frequently take *depressa* from the "clean" bottoms over which the trawlers usually work.

Chelonia depressa nests on both mainland and offshore island beaches. In 1967 nesting occurred during May and June at Smith Point and on Sandy Islands Numbers One and Two. Occasional nesting occurred at all other times, but the period of most concentrated nesting took place on Sandy Island Number Two during March-April, when daytime checks of tracks indicated laying by 3-5 females each night. From information supplied by local natives it would seem that the greatest concentration of nesting occurs on Greenhill Island (see fig. 1). At the time of our only visit to this island (May 5th, 1968) little nesting was evident. Moderate nesting activity was observed in the Sir Edward Pellew Islands during October, 1967, with abundant evidence of massive nesting activity on Pearce Islet just prior to our visit. Hatchlings of this species born on Sandy Island Number One or Two have only a narrow beach to cross before reaching the sea, since all observed nests had been made just within the edge of the flat grassy areas of the islands. The mainland nesting beaches are mostly less protected by offshore reefs than those of the two islands and most are backed by one or more dunes with only occasional beach oaks (*Casuarina* sp.) and little or no grass. The nesting procedure most commonly adopted by *C. depressa* on these beaches is to proceed up rising ground either until the top of the dune or a level surface is reached, or until a patch of fallen *Casuarina* leaves or grass is entered. In most instances one or more trial excavations (without egg chambers) are left along the route from the water's edge to the final nesting excavation. At Smith Point three nests were noted approximately 80 metres from the high water mark; on two occasions the females that had nested on the top of dunes headed

inland from their nest sites before they apparently instinctively realised their error and returned to the sea. Another specimen proceeded across a beach dune onto a grassy flat behind, and after attempting unsuccessfully to make an excavation in the hard ground re climbed the dune and successfully nested slightly on the seaward side of the dune's crest. In 14 nests where the eggs were counted the clutch sizes ranged from 41 to 74 (mean 53). The diameters of eggs varied from 49 mm. to 54 mm. (mean 52.1). Incubation times (as defined under *Lepidochelys olivacea*) for six nests varied from 45 to 56 days (mean 50.2).

GREEN TURTLE, *Chelonia mydas* (Linne)

Although, because of its economic importance, *C. mydas* has attracted more attention than other marine turtles, its presence and relative abundance in the waters of northern Australia have been in question.

Williams *et al.* (1967) were unable to locate any specimens of *C. mydas* from areas west of Torres Strait. They also pointed out the difficulty in referring literature records of "green turtles" from this area to either *C. mydas* or *C. depressa*.

Chelonia mydas is, indeed, abundant in Northern Territory waters, where it is a staple item in the diet of coastal aboriginals. It is much preferred to *Chelonia depressa*.

In the calm sultry weather experienced in March and April of both 1967 and 1968, numbers of subadult *C. mydas* congregated around the headlands on the north coast of the Peninsula apparently attracted by beds of algae.

On the 4th April, 1967, one boat-run close inshore, from Black Point to Sandy Island Number One, yielded sightings of twelve specimens of *C. mydas* as well as three subadult specimens of *Eretmochelys imbricata*. At other times not infrequent, but less concentrated, sightings of adult and smaller specimens were made in the same areas, usually of specimens disturbed feeding on the bottom in clear shallow water. The species appeared more wary when on the surface than other species except *Eretmochelys*. Copulating pairs of *C. mydas* were noted at Lingy Point on the 5th Sept., 1968 and at Black Point during October. The nesting of this species appears to be sparse on the Peninsula and only three nests were recorded in the course of the present work. Reliable reports indicate that large nesting aggregations occur on islands off the coast of north-western Australia and on some islands in the Gulf of Carpentaria. This species was not seen on the Sir Edward Pellew Islands in October, but local informants affirm that nesting of this species occurs commonly.

Chelonia mydas is offered statutory protection throughout most parts of northern Australia, but large numbers are still taken under license from Western Australia, and smaller numbers from the waters of Cape York Peninsula, to supply southern canneries. Little information is available on the numbers taken but the serious depletion of populations of this species throughout most parts of the world (Parsons, 1962) fully justifies the enlightened protective measures taken by the Commonwealth and various State Governments.

SUMMARY

Five species of marine turtles have been recorded from northern Australia. These are *Chelonia depressa*, *Chelonia mydas*, *Eretmochelys imbricata*, *Caretta caretta* and *Lepidochelys olivacea*.

Of these, *Lepidochelys* has been found to be a common species along the Arnhem Land coast, with widespread nesting in the region. In contrast, *Caretta caretta*, though apparently plentiful, is not known to nest in this area.

Both *Chelonia mydas* and *C. depressa* are common and widely distributed, and both species nest extensively in northern Australia. It is difficult to determine

which, if any, is more abundant, but nesting of *C. depressa* far exceeds that of *C. mydas* on the Coburg Peninsula.

An examination of a large series of *C. depressa* has confirmed the views of Fry (1913). We would go further than the "tentative" recognition of *depressa* by Williams *et. al.* (1967), for differences in morphology and ecology leave no doubt that *depressa* is a distinct and distinctive species. Indeed, we suggest that these differences are so great as to warrant, within the context of current cheloniid taxonomy, a re-examination of the status of the genus *Natator* McCulloch.

Although *Eretmochelys imbricata* is common throughout the area under discussion, adults are only occasionally seen; reports of nesting are frequent, but none of these has been confirmed.

ACKNOWLEDGMENTS

For their support we wish to thank the Director and Trustees of the Australian Museum, the Director, Primary Industry Branch, Northern Territory Administration and Dr. H. J. Frith, Chief of the Division of Wildlife Research of C.S.I.R.O. We are also grateful to the following individuals for their assistance in the field or for responding to our enquiries: Mr. Kent Keith, Mr. E. Slater and Mr. W. Braithwaite (C.S.I.R.O.); Mr. M. Weise (Mount Isa Mines); Dr. H. R. Bustard (Australian National University); Mr. F. J. Mitchell (South Australian Museum); and Dr. G. M. Storr (Western Australian Museum).

REFERENCES

- Barbour, T., 1914.—On some Australasian Reptiles. *Proc. Biol. Soc. Wash.* 27:201-206.
- Baur, G., 1890.—The Genera of the Cheloniidae. *Amer. Nat.* 24:486-487.
- Boulenger, G. A., 1889.—Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles in the British Museum. London pp. 184-186.
- Brongersma, L. D., 1961.—Notes upon some Sea Turtles. *Zool. Verh., Leiden*, 51:1-46.
- Bustard, H. R., 1966.—Turtle Biology at Heron Island. *Aust. Nat. Hist.* 15(8):262-264.
- Bustard, H. R., 1968.—Protection for a Rookery. Bundaberg Sea Turtles. *Wildlife in Australia*. 5(2):43-44.
- Carr, A., 1952.—Handbook of Turtles. Comstock Publishing Associates, New York, pp. 1-542.
- Carr, A., 1964.—The Reptiles. Time Life International (Nederland) N.V. (The Hague), p. 156.
- Deraniyagala, P. E. P., 1933.—The Loggerhead Turtles (Caretidae) of Ceylon. *Ceylon J. Sci.* 18(1):61-72.
- Deraniyagala, P. E. P., 1934.—Relationships among Loggerhead Turtles (Caretidae). *Ceylon J. Sci.* 18(2):207-209.
- Deraniyagala, P. E. P., 1953.—A colored Atlas of some Vertebrates from Ceylon, Vol. 2, Government Press, Colombo, pp. 1-101.
- Fry, D. B., 1913.—On the Status of *Chelonia depressa* Garman. *Rec. Aust. Mus.* 10(7):159-185.
- Glauert, L., 1928.—The Vertebrate Fauna of Western Australia. *J. Proc. R. Soc. West. Aust.* 14:61-77.
- Harrison, Tom. (1961).—Notes on the Green Turtle (*Chelonia mydas*): 9, Some new Hatchlings Observations. *Sarawak Mus. J.* 10(17-18):293-299.
- Harrison, Tom. (1962).—Present and Future of the Green Turtle. *Oryx*, 6(5):1-5.
- Loveridge, A. (1934).—Australian Reptiles in the Museum of Comparative Zoology, Cambridge, Massachusetts. *Bull. Mus. Comp. Zool., Harv.* 77(6):261.
- Loveridge, A., 1945.—Reptiles of the Pacific World. MacMillan Co., New York, pp. 18-19.

- McCann, C., 1966.—The Marine Turtles and Snakes Occurring in New Zealand. *Rec. Dom. Mus., Wellington*. 5(21):201-215.
- McCulloch, A. R., 1908.—A New Genus and Species of Turtle, from North Australia. *Rec. Aust. Mus.* 7(2):126-128.
- Mertens, R. and Wermuth, H., 1955.—Die rezenten Schildkroten, Krokodile und Bruckenechsen. *Zool. Jb.* 83(5):323-440.
- Moorhouse, F. W., 1933.—Notes on the Green Turtle (*Chelonia mydas*) Rep. *Gt. Barrier Reef Comm.* 4(1):1-22.
- Musgrave, A. and Whitley, G. P., 1926.—From Sea to Soup. *Aust. Mus. Mag.* 2(10): 331-336.
- Parsons, J. J., 1962.—The Green Turtle and Man. University of Florida Press, pp. 1-126.
- Pritchard, P. C. H., 1967.—Living Turtles of the World. T.H.F. Publications, Hersey City, pp. 1-288.
- Siebenrock, F., 1909.—Synopsis der rezenten Schildkroten. *Zool. Jb. Suppl.* 10, pp. 427-618.
- Smith, M. A., 1931.—The Fauna of British India, including Ceylon and Burma. Reptilia and Amphibia. Vol. 1, Loricata, Testudines. Francis and Taylor, London, pp. 1-185.
- Williams, E. E., Grandison, A. G. C. and Carr, A. F., 1967.—*Chelonia depressa* Garman re-investigated, *Breviora*, 271:1-15.
- Worrell, E., 1963.—Reptiles of Australia. Angus and Robertson, Sydney, p. 10.

EXPLANATION OF PLATES

- Plate VI *Lepidochelys olivacea* nesting at Black Point, Port Essington. (Photo: D. Lindner).
- Plate VII Upper Left.—*Chelonia depressa* covering nest site, North Island; Sir Edward Pellew Group, Northern Territory.
Upper Right.—*Chelonia mydas* basking on reef flat of Heron Island, Capricorn Group, Queensland.
Lower Left.—*Caretta caretta* nesting on Heron Island.
Lower Right.—Subadult *Eretmochelys imbricata*, Heron Island.

(Photos: H. G. Cogger).